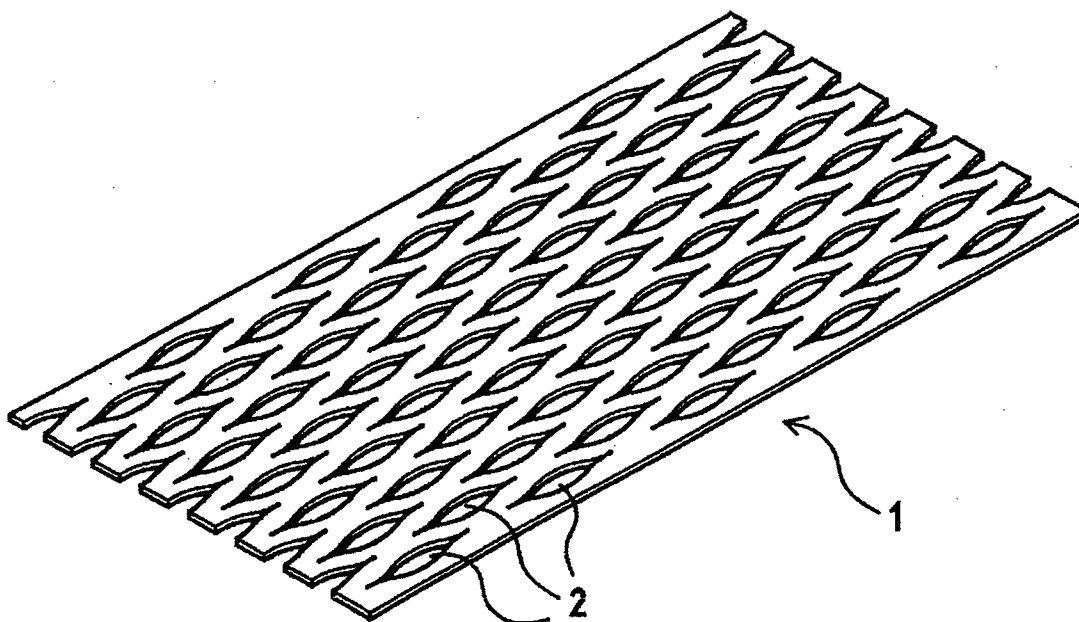


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(71) Applicant (for all designated States except US): FAGERDALA TUOTANTO OY [FI/FI]; Väkkärantie 97, FIN-23800 Laitila (FI).			
(72) Inventor; and (75) Inventor/Applicant (for US only): LAAKSONEN, Kari [FI/FI]; Pato 5, FIN-23800 Laitila (FI).			
(74) Agent: LAITINEN, Pauli, S.; Patentti-Laitinen OY, P.O. Box 29, FIN-02771 Espoo (FI).		Published With international search report.	

(54) Title: CELLULAR PLASTIC MATERIAL



(57) Abstract

The invention relates to a cellular plastic material (1), in which there are cuts (2), which can be pulled open by stretching the material. The material can be used as a material permitting ventilation in applications close to the skin.

Cellular plastic material

The present invention relates to a cellular plastic material, more precisely such a material that can be used, for example, as a flotation material in flotation devices, such as flotation jackets, boating jackets and similar personal safety devices, or as an impact-absorbent material in sportswear and similar. Naturally, its use is not limited to only these applications.

Nowadays, various forms of life jackets are known and used when moving on water. Several different forms of these are known, the two most common basic types being life jackets and the somewhat lighter boating jackets. The general principle of the aforesaid rescue devices is that they have a basic form of a jacket secured around the upper body, which supports a person who falls into the water. In life jackets proper, there is often also a section that turns an unconscious person onto his back in the water and holds his head above water, preventing drowning.

A general feature of all jackets is that contained within various kinds of supporting fabrics there is a flotation material, intended to provide the actual support, as it is essentially impermeable to water and lighter than water. The conventional material is a sheet of closed-cell plastic, located within a compartment in the structure of the jacket.

Conventional jackets are to some extent uncomfortable to use, because the structure of the closed-cell plastic does not naturally breathe, so that the wearer of a tightly-fitting non-breathing jacket easily begins to sweat, thus increasing the already cramped feeling caused by the jacket. Solutions are also known that attempt to reduce perspiration by holes made in the material. The drawback with such a solution is the waste of material, as the parts removed can seldom be sensibly used.

Material of the flotation type described above is used in a great deal of sportswear as an impact-absorbing material. For example, cellular plastic sheets are used in ice-hockey players' trousers and other equipment, to soften the impact of the puck or blows, collisions and similar caused by other players.

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Such equipment is often extremely sweaty, because the impact protection material does not breathe, nor can it be made from a material with a basic structure permitting the passage of air, as then it would also absorb sweat, making its use difficult in that respect.

5

This invention is intended to alleviate the non-breathing construction of rescue devices, sportswear and similar, making them more comfortable to use, and, especially in the case of rescue devices, also making their use on the water more likely. A further purpose is to create solutions that save material compared to the state of the art.

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The above and other benefits and advantages of this invention have been achieved in the manner described as characteristic in the accompanying Claims.

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The following more detailed description of the invention refers to the accompanying drawings, in which:

Figure 1 shows the invention in the normal position and

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Figure 2 shows the invention in the opened position.

25

Thus, figures 1 and 2 show a material according to the invention, made for flotation, impact-absorption, thermal insulation or other similar purposes, which is here in the form of a sheet-like piece 1. The thickness of the material is always selected according to the use, the raw material being mainly closed-cell plastic, so that it does not essentially absorb moisture, but which has excellent flotation properties, the hardness of the material being selected to also meet the criteria required for impact resistance. Thermal insulation properties can also be selected by the choice of material for individual cases.

30

The material sheet 1 shown in figure 1 has cuts 2 in it, made, for example, as in figure 1, i.e., as essentially parallel cuts, arranged to lie partly between each other in adjacent rows. Of course, it is obvious that the cuts can be arranged differently, as in figure 2, allowing the material to be made to breathe and ventilate. The cuts

are made through the material, so that at each cut there is always also a through hole. Even after the cuts are made, the material retains its external character.

5 Figure 2 shows how the material described in figure 1 above is made into precisely a breathing substance, in a way that saves material. If the material in figure 1 is pulled in a transverse direction to the cuts, the material opens at the cuts, forming the cuts 2 into elongated holes. Figure 2 shows a stretched material of this kind. If the material can be secured in this kind of stretched state for its final application, for example, by sewing the material at its edges into a form that will provide flotation or
10 impact absorption, the openings 2 will remain open and the material will permit the passage of air to ventilate the skin beneath it.

However, in many cases the material according to the invention is placed loosely as a sheet-like piece in the desired space, such as a reserved pocket within the
15 trousers of an ice-hockey player, which requires some other way to keep the openings open to ensure ventilation. According to the invention, the openings can be kept open particularly by laminating, to one side of the material, a fabric of a sufficiently open weave that air can pass through it freely, but which, when attached to the entire backing, gives the material a shape in which the openings are open.
20 This kind of lamination also creates another big advantage of the material according to the invention, i.e., flexibility. This is because, if a sheet-like material is used, which has not been processed in any way, the material will be stiff. Now, instead, the material will be made flexible by opening its structure.

25 Alternatively, it is advantageous for certain purposes first to carry out the lamination, either on the fabric or, for certain applications for example on a thin polyurethane membrane, and only after that to make the cuts. It is also possible to use a combination, where two or more laminations are made before and/or after making the cuts, according to the application.

30

It is obvious that the raw substance of the material according to the invention can be any mainly plastic-based material at all that is suitable for the purpose and which has the desired characteristics. For example, the closed-cell foamed plastics made for many purposes from polyethylene and polyvinyl chloride are also suitable for this

invention. However, it is also obvious that, if impermeability to water is not a necessary property in the material, the cellular plastic material does not have to be closed-cell.

5 The invention can be adapted in many ways, without deviating from the inventive idea or the scope of the protection defined by the accompanying Claims. Thus, for example, although the above-described applications lie relatively tightly against a person's skin, as a costume of some kind, this need not be so in every case. The applications may also be such, in which the material according to the invention is
10 used as an external structure, with which a person's skin only comes into contact now and then. Possible examples include seat covers, shoe insoles and similar applications.

For example, seat cushions are used with garden furniture in summer, and should
15 preferably be of a material that does not absorb water, because then the seats need not be protected as carefully from showers of rain and similar occurrences. Closed-cell plastic does not absorb water, but in the heat of summer it is a sweaty material to sit on. The solution is to use a material according to the invention in the seat cushions.

20 It should also be mentioned that it is not only people who need non-sweaty material. For example, horse blankets are often made from a felt-based material. The felt becomes wet both from the animal's sweat and from rain, etc, after which it undoubtedly becomes unpleasant and retains heat poorly. A material according to
25 the invention, which does not absorb water and is flexible and breathes, can be used to make a much warmer and more comfortable horse blanket.

One area of use is as a material with excellent thermal insulation. Such applications include various thermal jackets and so-called survival suits.

30 No matter where the material according to the invention is used, it will save considerable amounts of material compared to any known solution. Material savings are often in the order of 30 to 50% of the amount of materials used in known solutions.

It is obvious that the invention can be used in numerous applications not specifically mentioned in the present connection.

Claims

1. A cellular plastic material (1), for use particularly in applications in which the material is, for longer or shorter periods, close to the skin, **characterized** in that it includes cuts (2) made through the material, which can be pulled into openings by stretching the material.
2. A material according to Claim 1, **characterized** in that the material (1) has, at least on one of its sides, fabric or similar material which has been laminated onto the material (1) either after it has been stretched so that the cuts are kept open, or alternatively in an unstretched state.
3. Material according to Claim 1, **characterized** in that the cuts (2) are in essentially straight rows and that the cuts in adjacent rows lie partly between each other.
4. A material according to Claim 1, **characterized** in that the material is made of closed-cell plastic material.
5. A material according to Claim 4, **characterized** in that the material is polyethene or polyvinyl chloride.
6. Use of a material according to any of the above Claims in life jackets or other flotation applications, or as an impact-absorbing material in, for example, sportswear.
7. Use of a material according to any of the above Claims 1 to 5 in seat cushions and in various cover-type solutions for both people and animals.
8. Use of a material according to any of the above Claims 1 to 5 in thermal jackets, survival suits and similar solutions requiring thermal insulation capacity.

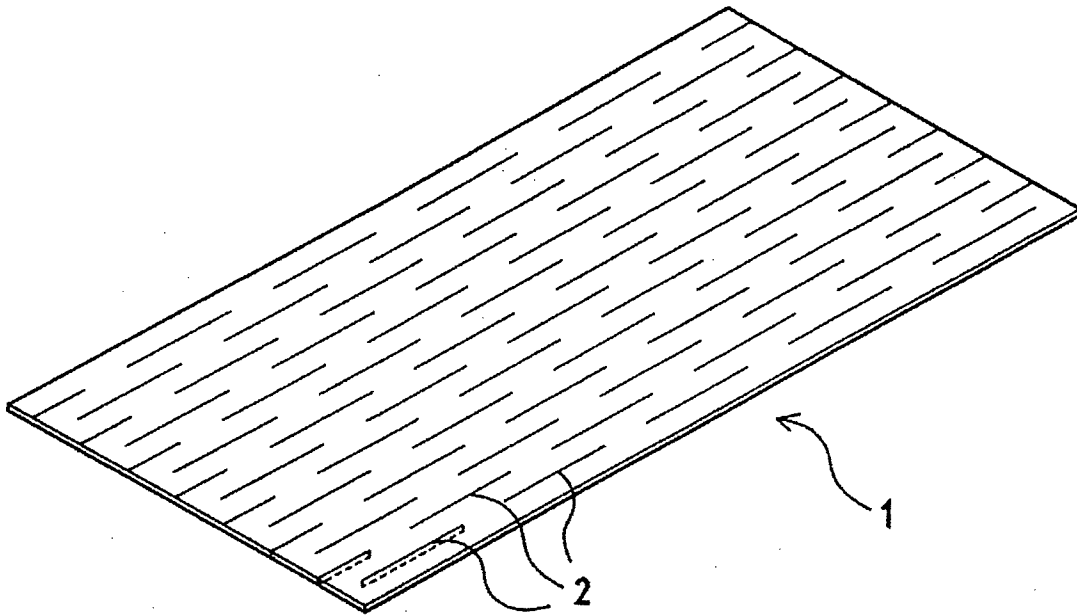


Fig.1

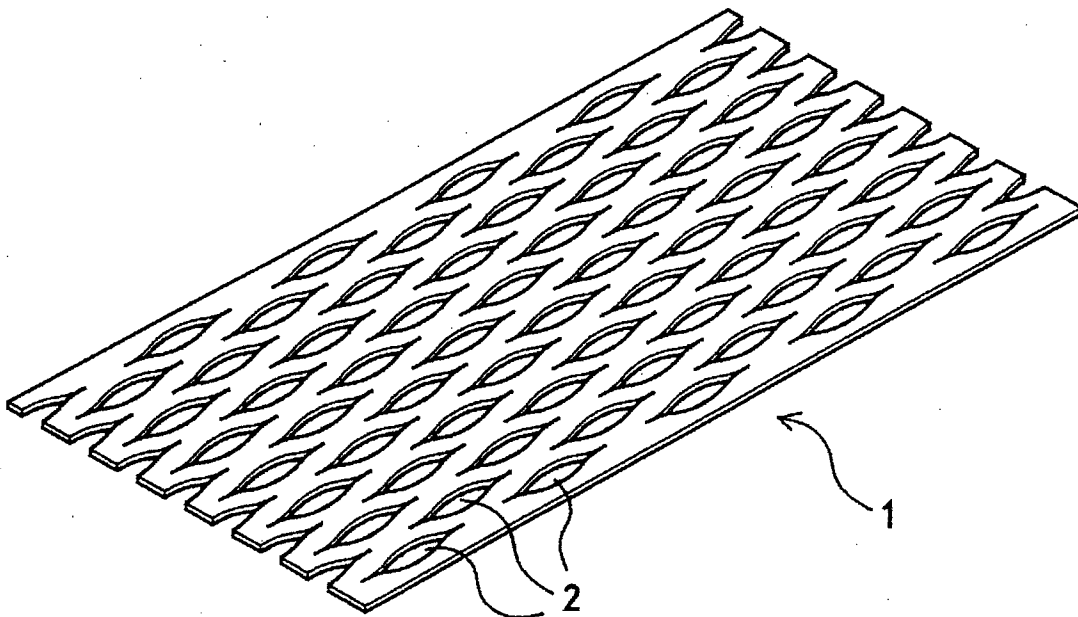


Fig.2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 98/00434

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B29C 67/20, B32B 3/12, B32B 5/18, B63C 9/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B32B, B29D, B29C, B63C, C08J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIL, EDOC

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Y	--	2-8
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Y	US 4167051 A (ROBERT A. GALECKE), 11 Sept 1979 (11.09.79)	6,8

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 August 1998

Date of mailing of the international search report

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Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Fax: +46 8 666 02 86

Authorized officer

Jörgen Winther

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 98/00434

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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International application No.
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